

REMARKS

Claims 1-3, 5-17, 19-21, 23 and 24 are pending in this application.

Rejections under 35 U.S.C § 103:

Claims 1, 2, 5-10, 12, 13, 21 and 23 stand rejected under 35 U.S.C § 103 (a) as unpatentable over Lindley (U.S. Patent 6,326,307) in view of Gabriel (U.S. Patent 6,103,457).

Claims 1, 9, 12 and 21 recite, *inter alia*, an etching method comprising treating a photoresist pattern with plasma generated by exciting a fluorine-free carbon-containing gas.

The Office Action acknowledges that Lindley fails to disclose the above features. At the very least, Lindley does not disclose a fluorine-free carbon containing gas used in a pretreatment process. For this element, the Office Action relies on Gabriel. The Examiner contends that the carbon-based gas of Garbiel is a fluorine-free carbon containing gas and can replace fluorine-based gases of Lindley in the pretreatment process because Gabriel states that “in addition or as an alternative to the fluorocarbon plasma, the treatment may also expose the photoresist layer 208 to fluorine-based plasma such as SF₆ or carbon-based plasma”. [Emphasis added]. Then, the Examiner concluded that “Gabriel teaches that this type of gas [i.e., a carbon-based gas] can create plasma that works just as well as the fluorocarbon plasma at protecting the photoresist layer against etching.” In responding to Applicants’ previous arguments, the Examiner contends that “Gabriel is being used to teach that a carbon-based plasma can be used to protect a photoresist from an etchant, regardless of the type of etchant used in the process”.

[Emphasis added]. See pages 6-7 of the Final Office Action. Applicants respectfully disagree.

Applicants May Argue That The Examiner's Conclusion Of Obviousness Is Based On Improper Hindsight Reasoning

Applicants may argue that the examiner's conclusion of obviousness is based on improper hindsight reasoning. However, "[a]ny judgement on obviousness is in a sense necessarily a reconstruction based on hindsight reasoning, but so long as it takes into account only knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made and does not include knowledge gleaned only from applicant's disclosure, such a reconstruction is proper." *In re McLaughlin* 443 F.2d 1392, 1395, 170 USPQ 209, 212 (CCPA 1971).

Applicants respectfully submit that replacing fluorine based gases in a pretreatment process of Lindley with a carbon based gases in a pretreatment process of Gabriel is at most knowledge gleaned only from applicant's disclosure.

In contrast to the Examiner's assertions above, the type of etchant used in a main etching process is relevant to select a proper pretreatment plasma gas. For instance, Gabriel describes that "the fluorocarbon plasma exposure reduces the sensitivity of the photoresist layer (208) surface to the metal etchants by hardening the photoresist layer (208)." As such, Gabriel clearly establishes a relevancy between the metal etchant used in the main etching process and the fluorocarbon pretreatment plasma gas. Furthermore, the present application describes how the fluorine free carbon based pretreatment gas is relevant to an etchant used in a subsequent main etching process. For example, the present application states that "If the gas that provides carbon contains fluorine and is

excited to generate plasma, not only carbon radicals but also fluorine radicals are generated. Thus, a polymer layer formed on the photoresist pattern contains fluorine. As a result, fluorine radicals generated in a subsequent etching process may eat away the photoresist pattern through the medium of the fluorine contained in the polymer layer.” See paragraph [0037] of the present application.

Accordingly, even if Gabriel describes that carbon based gas can be an alternative to fluorocarbon based gas in a pretreatment process, this coincidence does not allow an automatic combination of the carbon based pretreatment gas in Gabriel with fluorine based main etching gas in Lindley. In other words, without the suggestions of the present application, one ordinary skill in the art would not look to the carbon based pretreatment gas in Gabriel to use in combination with the fluorine based main etching gas in Lindley because the etching targets of Lindley (metal) and Gabriel (oxide) are different.

Accordingly, the Examiner’s reliance on Gabriel to support the rejection under section 103 is misplaced and the rejection of claims 1, 9, 12, and 21 is legally deficient.

Thus, claims 1, 9, 12 and 21 are not rendered obvious by Lindley in view of Gabriel. As claims 2, 5-8, 10, 13 and 23 depend from claims 1, 9, 12 and 21, respectively, they are also not rendered obvious by Lindley in view of Gabriel for at least the above regions.

Based on the arguments above, reconsideration and withdrawal of the rejection of claims 1, 2, 5-10, 12, 13, 21 and 23 under 35 U.S.C § 103 (a) is respectfully requested.

Claims 3, 11, 14 and 24 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Lindley and Gabriel in view of Ko (U.S. Patent Application 2003/0129816).

As discussed above, Lindley and Gabriel do not disclose treating a photoresist pattern with plasma generated by exciting a fluorine-free carbon-containing gas, as essentially recited in claims 1, 9, 12 and 21.

Ko does not cure the deficiency of Lindley and Gabriel with regard to the above feature. Accordingly, independent claims 1, 9, 12 and 21 are patentable over Lindley and Gabriel in view of Ko. Claims 3, 11, 14 and 24 depend from claims 1, 9, 12 and 21, respectively. Thus, these dependent claims are also patentable for at least the same reasons given for the respective base claims.

Therefore, Applicants respectfully request that the Examiner withdraw the rejections of claims 3, 11, 14 and 24 under 35 U.S.C. 103(a) and claims 3, 11, 14 and 24 are in condition for allowance.

Claims 15-17, 19 and 20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Lindley in view of Gabriel and further in view of Ma (U.S. Patent 6,830,877).

Claim 15 recites, *inter alia*, treating a photoresist pattern with plasma generated by exciting a fluorine-free carbon-containing gas. As discussed above, neither Lindley, Gabriel, nor any combination thereof teaches or suggests the above feature.

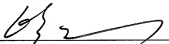
Ma does not cure the deficiency of Lindley and Gabriel with regard to the above feature. Accordingly, claim 15 is patentable over Lindley and Gabriel in view of Ma.

Claims 16, 17, 19 and 20 depend from claim 15. Thus, claims 16, 17, 19 and 20 are also patentable for at least the same reasons given for claim 15.

Therefore, Applicants respectfully request that the Examiner withdraw the rejections of claims 15-17, 19 and 20 under 35 U.S.C. 103(a) and claims 15-17, 19 and 20 are in condition for allowance.

For the foregoing reasons, the present application is believed to be in condition for allowance. The Examiner's early and favorable action is respectfully requested. The Examiner is invited to contact the undersigned if he has any questions or comments in this matter.

Respectfully submitted,



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